

Roll No.

23258

**M.Tech (Electrical Engg)
Specialization: Electrical Power
System Ist Semester
Examination- January, 2013**

HVDC Transmission

Paper MTEPS-102

Time : 3 hours

Max. Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

Note : Attempt any **five** questions.

1. (a) Draw the schematic diagram of a typical HVDC converter station and explain the functions of various components. 10
- (b) List the various types of DC links and distinguish between them, using their schematic diagrams. 10

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2. (a) Explain the three phase bridge type converter in detail. Complete with waveforms and figures. 10
- (b) Give an analysis of 3-phase bridge converter with grid control overlap angle $\mu \leq 60^\circ$. 10
3. (a) How do you estimate the harmonic order based upon pulse number of HVDC converter station ? 10
- (b) Discuss the performance indices which can be used to reduce the telephone interference for AC filter design. Also name the various AC filters that can be used to filter out higher harmonics. 10
4. (a) Discuss system control hierarchy for a HVDC link and explain firing angle control in HVDC values. 10
- (b) What is meant by reactive power control ? How is it achieved ? Explain. 10

5. (a) Discuss parallel operation of AC and DC systems. How is AC operation interfaced with DC system ? Discuss. 10
- (b) What is the importance of harmonics in HVDC transmission ? How is characteristic harmonics different from non characteristic harmonics ? Discuss. 10
6. (a) Classify the solution methodology for AC-DC load flow and explain. 10
- (b) Discuss the conventional control strategies and alternate control strategies adopted in HVDC systems. 10
7. Discuss protection aspects of a HVDC link against overvoltages. Also mention types of overvoltages in above link. Show the schematic diagram of surge arrestors for a converter pole. 20

8. Write short notes on :

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- (a) Circuit Breakers
 - (b) Converter faults
 - (c) Over current protection.
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